IN THE CLAIMS

This listing of claims will replace all prior versions and listings of claims in the application:

Listing of Claims:

1 Claim 1. (*Currently Amended*) An apparatus for creating, managing and publishing interactive virtual

2 tours, the apparatus comprising:

3   a panorama data acquisition unit implementing means of capturing panoramic data representing

4 a plurality of environment maps and preparing said panoramic data for further processing, wherein said

5 panoramic data acquisition unit comprises at least one versatile device for creating representations of

6 stimuli covering substantially all directions around a given reference or view point, said versatile device

7 for creating representations of stimuli comprising at least one grid of one or more focusing elements

8 disposed on an N-dimensional shaped surface, at least one grid of one or more sensor elements

9 disposed on an N-dimensional shaped surface, and at least one grid of one or more stimulus guide

10 elements disposed on an N-dimensional shaped surface, wherein said focusing element grid is adapted

11 to focus stimuli covering substantially all directions around a given reference or view point onto the

12 sensor element grid via the stimulus guide unit, wherein each focusing element or group of focusing

13 elements is associated with and focuses a subset of the entire stimulus space onto a sensor element or

14 group of sensor elements responsive to the stimuli, wherein when a stimulus guide element grid is

15 provided, the focusing element grid is adapted to focus the stimuli onto the stimulus guide element grid

16 for formatting and onward transmission to the sensor element grid, wherein when used, each stimulus

17 guide element or group of elements is associated with and receives stimuli from a focusing element or

18 group of focusing elements and is in turn associated with and transmits stimuli to a sensor element or

19 group of sensor elements;

20　　　　a transform engine responsive to said panoramic data and implementing means of correcting

21　distortions in said panoramic data and/or performing automatic, manual or interactive calibration of said

22　panoramic data and/or transforming said panoramic data into a desired format or set of formats when

23　necessary, wherein said distortion correction is accomplished through steps of:

24　　　　a) loading data including reference data that could be used to derive panoramic imaging

25　system distortion profiles;

26　　　　b) specifying a linear or other predetermined distortion function or set of distortion

27　functions and displaying representations of said distortion function or set of distortion functions;

28　　　　c) using distortion function or set of distortion functions to build a distortion profile for

29　the panoramic imaging system that was used to acquire the reference data;

30　　　　d) performing transformation on panoramic data using distortion profile specified in c)

31　and displaying results of said transformation;

32　　　　e) determining whether distortion is satisfactorily corrected;

33　　　　f) continuing with steps g) and h) if distortion is deemed not to have been satisfactorily

34　corrected and continuing with step i) if distortion is deemed to have been satisfactorily corrected;

35　　　　g) automatically or interactively modifying the distortion function or set of distortion

36　functions using feedback from displayed distortion function representation or transformation results

37　obtained in step d) or by using data loaded in step a);

38　　　　h) repeating steps c) to g) until distortion is judged to have been satisfactorily corrected;

39　　　　i) storing distortion profile obtained in step c) for use in performing transformations on

40　panoramic data acquired using the panoramic imaging system for which data was loaded in step a);

41　　　　a package generator adapted to generate virtual tour packages containing said panoramic data,

42　commands and/or virtual tour data;

43   a viewing engine responsive to said panoramic data and/or virtual tour packages and

44   implementing means for perspective correction, and user interaction with, said panoramic data and/or

45   virtual tour data when necessary;

46   a control engine adapted to facilitate a higher level of interaction with said panoramic data

47   ~~and/or~~ and virtual tour data, wherein said control engine is connected operatively to and communicates

48   bi-directionally with said viewing engine, renders representative information about all or parts of said

49   virtual tour, permits a particular portion to be selected from said virtual tour and sends signals to said

50   viewing engine that cause said viewing engine to permit the interactive navigation of said selected

51   portion of said virtual tour, wherein said control engine also indicates or causes to be indicated what

52   portion of said virtual tour is currently selected and what sub-part of said selected portion of said virtual

53   tour is currently rendered, wherein said control engine is responsive to user input ~~and/or~~ and commands

54   from said viewing engine and is in turn capable of modifying said representative information about all

55   or parts of said virtual tour in response to said user input ~~and/or~~ and said commands from said viewing

56   engine and is further capable of communicating information indicative of such externally induced

57   modifications to said user ~~and/or~~ and said viewing engine;

58   a display means for rendering output of said viewing engine, control engine, package generator,

59   transform engine, and/or panoramic data acquisition unit.

1   Claim 2. (*Original*) The apparatus of claim 1, wherein said panoramic data acquisition unit is adapted

2   to capture data representing 2D panoramic images or video, 3D or stereoscopic panoramic images or

3   video, holographic data, infrared data, ultrasonic data or ultraviolet data.

Claim 3.(*Canceled*)

Claim 4. (*Currently Amended*) The apparatus of claim [[3]] 1, wherein said ~~versatile device for~~ ~~creating representations of stimuli covering substantially all directions around a given reference or view~~ ~~point comprises at least one grid of one or more sensor elements disposed on an N-dimensional and~~ ~~arbitrarily shaped surface, said~~ at least one grid of one or more sensor elements is responsive to electromagnetic radiation.

Claim 5. (*Original*) The apparatus of claim 1, wherein said panoramic data acquisition unit comprises a spherical image/video acquisition unit comprising at least one grid of one or more photosensitive elements on a surface with a spherical geometry or an approximation thereto and at least one enclosing concentric grid of one or more focusing elements on a surface with a spherical geometry or an approximation thereto.

Claim 6. (*Original*) The apparatus of claim 1, wherein said panoramic data acquisition unit comprises a panoramic imaging system characterized by a 360-degree lateral field of view and a vertical field of view that is usually less than 180 degrees.

Claim 7. (*Original*) The apparatus of claim 1, wherein said panoramic data acquisition unit is adapted to capture each complete panoramic data block in a single image/video frame.

Claim 8. (*Original*) The apparatus of claim 1, wherein said panoramic data acquisition unit is adapted to capture each complete panoramic data block in a plurality of image/video frames that are combined to form complete panoramic data blocks.

1   Claim 9. (*Previously Presented*) The apparatus of claim 1, wherein said associated virtual tour data

2   includes audio, video, text, graphics, pointers to resources on local and distributed networks or virtual

3   tour packages.

1   Claim 10. (*Currently Amended*) The apparatus of claim 1, wherein said panoramic data acquisition

2   unit further comprises means of preparing and transferring all or portions of acquired panoramic data

3   to said transform engine, said ~~optional~~ package generator, said viewing engine, said control engine or

4   said display; wherein said preparation ~~and/or~~ and transfer involves compression ~~and/or~~ and

5   decompression of all or portions of acquired panoramic data; wherein said preparation and/or transfer

6   is in response to user commands or information inferred from the state of said viewing engine or said

7   control engine.

1   Claim 11. (*Original*) The apparatus of claim 1, wherein said transform engine implements means of

2   converting panoramic data from a first format to one or more formats and/or vice versa.

1   Claim 12. (*Original*) The apparatus of claim 11, wherein said panoramic data conversion is between

2   polar and rectilinear coordinates, polar and spherical coordinates, spherical and rectilinear coordinates,

3   cubic and spherical coordinates, cubic and polar coordinates or cubic and rectilinear coordinates.

1   Claim 13. (*Original*) The apparatus of claim 1, wherein said distortion function or set of distortion

2   functions is based on a polynomial or a set of polynomials of suitable degree.

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1   Claim 14. (*Original*) The apparatus of claim 1, wherein said package generator implements means

2   of specifying active regions and/or volumes on said panoramic data and/or virtual tour data for

3   programming reference.

1   Claim 15. (*Original*) The apparatus of claim 1, wherein said package generator implements means

2   of specifying navigable paths or walk-through sequences on said panoramic data and/or virtual tour

3   data.

1   Claim 16. (*Original*) The apparatus of claim 15, wherein said navigable paths or walk-through

2   sequences are navigated in automatic or guided mode.

1   Claim 17. (*Original*) The apparatus of claim 1, wherein said panoramic data, virtual tour data,

2   commands, navigable paths or walk-through sequences, virtual tour packages and/or distortion profiles

3   are managed using a universal file format, said universal file format specifying a header identifying the

4   file type and containing information as to the number, types, locations and sizes of elements it contains,

5   wherein each element in the file is in turn described by a header specifying the type of element, its size

6   and any relevant data, commands or attributes and the types, locations and sizes of any additional

7   elements it contains, thus making it possible for arbitrary types and numbers of elements to be managed

8   by said universal file format.

1   Claim 18. (*Original*) The apparatus of claim 1, wherein said viewing engine is responsive to user input

2   and implements means for perspective correction of said panoramic data, navigable paths or walk-

3   through sequences and/or virtual tour packages.

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1   Claim 19. (*Original*) The apparatus of claim 1, wherein said viewing engine further implements means

2   of navigating said panoramic data, navigable paths or walk-through sequences and/or virtual tour

3   packages.

1   Claim 20. (*Original*) The apparatus of claim 1, wherein said viewing engine implements means for a

2   single user or a plurality of users to independently and simultaneously interact with and navigate said

3   panoramic data, navigable paths or walk-through sequences and/or virtual tour packages.

4   Claim 21. (*Original*) The apparatus of claim 1, wherein said viewing engine implements means for a

5   plurality of users to interact with and navigate said panoramic data, navigable paths or walk-through

6   sequences and/or virtual tour packages in a collaborative, competitive, coordinated, and/or

7   synchronized manner.

1   Claim 22. (*Original*) The apparatus of claim 1, wherein said representative information rendered by

2   said control engine about all or parts of said virtual tour is rendered in 2D, 3D or higher dimensional

3   space and/or time.

1   Claim 23. (*Original*) The apparatus of claim 1, wherein said viewing engine and control engine

2   comprise a unitary structure.

1   Claim 24. (*Currently Amended*) A method of creating, managing and publishing interactive virtual

2   tours, said method comprising:

3   a panorama data acquisition step for capturing panoramic data representing a plurality of

4   environment maps and preparing said panoramic data for further processing, wherein said panoramic

5   data acquisition step utilizes at least one versatile device for creating representations of stimuli covering

6   substantially all directions around a given reference or view point, said versatile device for creating

7   representations of stimuli comprising at least one grid of one or more focusing elements disposed on

8   an N-dimensional shaped surface, at least one grid of one or more sensor elements disposed on an N-

9   dimensional shaped surface, and at least one grid of one or more stimulus guide elements disposed on

10   an N-dimensional shaped surface, wherein said focusing element grid is adapted to focus stimuli

11   covering substantially all directions around a given reference or view point onto the sensor element grid

12   via the stimulus guide unit, wherein each focusing element or group of focusing elements is associated

13   with and focuses a subset of the entire stimulus space onto a sensor element or group of sensor

14   elements responsive to the stimuli, wherein when a stimulus guide element grid is provided, the focusing

15   element grid can be adapted to focus the stimuli onto the stimulus guide element grid for formatting and

16   onward transmission to the sensor element grid, wherein when used, each stimulus guide element or

17   group of elements is associated with and receives stimuli from a focusing element or group of focusing

18   elements and is in turn associated with and transmits stimuli to a sensor element or group of sensor

19   elements;

20   a transform step for correcting distortions in said panoramic data ~~and/or~~ and performing

21   automatic, manual or interactive calibration of said panoramic data ~~and/or~~ and transforming said

22   panoramic data into a desired format or set of formats when necessary, wherein said ~~distortion~~

23   ~~correction~~ transform step for correcting distortions is accomplished through steps of:

24 a) loading data including reference data that could be used to derive panoramic imaging

25 system distortion profiles;

26 b) specifying a linear or other predetermined distortion function or set of distortion

27 functions and displaying representations of said distortion function or set of distortion functions;

28 c) using distortion function or set of distortion functions to build a distortion profile for

29 the panoramic imaging system that was used to acquire the reference data;

30 d) performing transformation on panoramic data using distortion profile specified in c)

31 and displaying results of said transformation;

32 e) determining whether distortion is satisfactorily corrected;

33 f) continuing with steps g) and h) if distortion is deemed not to have been satisfactorily

34 corrected and continuing with step i) if distortion is deemed to have been satisfactorily corrected;

35 g) automatically or interactively modifying the distortion function or set of distortion

36 functions using feedback from displayed distortion function representation or transformation results

37 obtained in step d) or by using data loaded in step a);

38 h) repeating steps c) to g) until distortion is judged to have been satisfactorily corrected;

39 i) storing distortion profile obtained in step c) for use in performing transformations on

40 panoramic data acquired using the panoramic imaging system for which data was loaded in step a);

41 a package generation step adapted to generate virtual tour packages containing said panoramic

42 data, commands and/or optional virtual tour data;

43 a viewing step responsive to said panoramic data and/or virtual tour packages and providing

44 means for perspective correction of, and user interaction with, said panoramic data and/or virtual tour

45 data when necessary;

46   ~~an optional~~ a control step adapted to facilitate a higher level of interaction with said panoramic

47   data and/or virtual tour data, wherein said control step is connected operatively to and communicates

48   bi-directionally with said viewing step, renders representative information about all or parts of said

49   virtual tour, permits a particular portion to be selected from said virtual tour and sends signals to said

50   viewing step that cause said viewing step to permit the interactive navigation of said selected portion

51   of said virtual tour, wherein said control step also indicates or causes to be indicated what portion of

52   said virtual tour is currently selected and what sub-part of said selected portion of said virtual tour is

53   currently rendered, wherein said control step is responsive to user input ~~and/or~~ and commands from

54   said viewing step and is in turn capable of modifying said representative information about all or parts

55   of said virtual tour in response to said user input ~~and/or~~ and said commands from said viewing step and

56   is further ~~optionally~~ capable of communicating information indicative of such externally induced

57   modifications to said user ~~and/or~~ and said viewing step;

58   a display step providing means for rendering output of said viewing step, control step, package

59   generation step, transform step, and/or panoramic data acquisition step.

1   Claim 25. (*Original*) The method of claim 24, wherein said panoramic data acquisition step is adapted

2   to capture data representing 2D panoramic images or video, 3D or stereoscopic panoramic images or

3   video, holographic data, infrared data, ultrasonic data or ultraviolet data.

Claim 26. (*Canceled*)

1　Claim 27. (*Currently Amended*) The method of claim [[26]] 24, wherein said ~~versatile device for~~

2　~~creating representations of stimuli covering substantially all directions around a given reference or view~~

3　~~point comprises at least one grid of one or more sensor elements disposed on an N-dimensional and~~

4　~~arbitrarily shaped surface, said~~ at least one grid of one or more sensor elements is responsive to

5　electromagnetic radiation.

1　Claim 28. (*Original*) The method of claim 24, wherein said panoramic data acquisition step utilizes

2　a spherical image/video acquisition unit comprising at least one grid of one or more photosensitive

3　elements on a surface with a spherical geometry or an approximation thereto and at least one enclosing

4　concentric grid of one or more focusing elements on a surface with a spherical geometry or an

5　approximation thereto.

1　Claim 29. (*Original*) The method of claim 24, wherein said panoramic data acquisition step utilizes

2　a panoramic imaging system characterized by a 360-degree lateral field of view and a vertical field of

3　view that is usually less than 180 degrees.

1　Claim 30. (*Original*) The method of claim 24, wherein said panoramic data acquisition step is adapted

2　to capture each complete panoramic data block in a single image/video flame.

1　Claim 31. (*Original*) The method of claim 24, wherein said panoramic data acquisition step is adapted

2　to capture each complete panoramic data block in a plurality of image/video frames that are combined

3　to form complete panoramic data blocks.

1   Claim 32. (*Previously Presented*) The method of claim 24, wherein said virtual tour data includes

2   audio, video, text, graphics, pointers to resources on local and distributed networks or virtual tour

3   packages.

1   Claim 33. (*Currently Amended*) The method of claim 24, wherein said panoramic data acquisition

2   step further comprises providing means of preparing and transferring all or portions of acquired

3   panoramic data to said transform engine, said ~~optional~~ package generator, said viewing engine, said

4   ~~optional~~ control engine or said display; wherein said preparation ~~and/or~~ and transfer <u>means</u> involves

5   compression ~~and/or~~ and decompression of all or portions of acquired panoramic data; wherein said

6   preparation ~~and/or~~ and transfer <u>means</u> is ~~optionally~~ in response to user commands or information

7   inferred from the state of said viewing engine or said control engine.

1   Claim 34. (*Original*) The method of claim 24, wherein said transform step implements means of

2   converting panoramic data from a first format to one or more formats and/or vice versa.

1   Claim 35. (*Original*) The method of claim 34, wherein said panoramic data conversion is between

2   polar and rectilinear coordinates, polar and spherical coordinates, spherical and rectilinear coordinates,

3   cubic and spherical coordinates, cubic and polar coordinates or cubic and rectilinear coordinates.

1   Claim 36. (*Original*) The method of claim 24, wherein said distortion function or set of distortion

2   functions is based on a polynomial or a set of polynomials of suitable degree.

1   Claim 37. (*Original*) The method of claim 24, wherein said package generation step implements

2   means of specifying active regions and/or volumes on said panoramic data and/or virtual tour data for

3   programming reference.

1   Claim 38. (*Original*) The method of claim 24, wherein said package generation step implements

2   means of specifying navigable paths or walk-through sequences on said panoramic data and/or virtual

3   tour data.

1   Claim 39. (*Original*) The method of claim 38, wherein said navigable paths or walk-through

2   sequences are navigated in automatic or guided mode.

1   Claim 40. (*Original*) The method of claim 24, wherein said panoramic data, virtual tour data,

2   commands, navigable paths or walk-through sequences, virtual tour packages and/or distortion profiles

3   are managed using a universal file format, said universal file format specifying a header identifying the

4   file type and containing information as to the number, types, locations and sizes of elements it contains,

5   wherein each element in the file is in turn described by a header specifying the type of element, its size

6   and any relevant data, commands or attributes and the types, locations and sizes of any additional

7   elements it contains, thus making it possible for arbitrary types and numbers of elements to be managed

8   by said universal file format.

1   Claim 41. (*Currently Amended*) The method of claim [[26]] 24, wherein said viewing step is

2   responsive to user input and implements means for perspective correction of said panoramic data,

3   navigable paths or walk-through sequences and/or virtual tour packages.

1　Claim 42. (*Original*) The method of claim 24, wherein said viewing step further implements means

2　of navigating said panoramic data, navigable paths or walk-through sequences and/or virtual tour

3　packages.

1　Claim 43. (*Original*) The method of claim 24, wherein said viewing step implements means for a single

2　user or a plurality of users to independently and simultaneously interact with and navigate said

3　panoramic data, navigable paths or walk-through sequences and/or virtual tour packages.

1　Claim 44. (*Original*) The method of claim 24, wherein said viewing step implements means for a

2　plurality of users to interact with and navigate said panoramic data, navigable paths or walk-through

3　sequences and/or virtual tour packages in a collaborative, competitive, coordinated, and/or

4　synchronized manner.

1　Claim 45. (*Original*) The method of claim 24, wherein said representative information rendered by

2　said control step about all or parts of said virtual tour is rendered in 2D, 3D or higher dimensional

3　space and/or time

1　Claim 46. (*Currently Amended*) The method of claim [[26]] 24, wherein said viewing step and

2　control step are implemented in a unitary structure.

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